Amendments to claims of 12. January 2005.

CLAIMS

1. (Currently amended) Packet switching data communications networks ~~or packet networks~~ with closed loop implicit feedback flow control **comprising**

a Window-Time-Space Flow Control, WTFC, where a determined single server queuing system model with a finite number of packets and known value of a total network capacity point W_0,T_0 of a total network window W_0 , a total serving time T_0 and an aggregated propagation time T_p define a window - time plane~~/space~~ of a packet window W and a delay time T, ~~said plane contains~~

a hyperbola through said W_0,T_0 and a set of network response curves ~~for various fractions~~ each for a fraction of total network capacity α, said hyperbola and said curves contained in said window – time plane, wherein each said response curve is determined with a break point ~~points~~ lying on said ~~the~~ hyperbola through W_0,T_0, ~~said plane together with~~

a current W,T point measurement, wherein said window – time plane is used to determine whether said W,T point is positioned above or below ~~the~~ said hyperbola, and to calculate optimal value of said capacity fraction α and said break point ~~coordinates~~ of the current response curve, wherein said break point ~~coordinates are~~ is used to calculate an optimal window $W_0(\alpha)$, ~~and~~ an optimal delay time $T_0(\alpha)$, and ~~their ratio to obtain~~ an optimal packet sending period $t'''(\alpha)$; ~~constructed using:~~

a terminal ~~terminals~~ that do use said window - time plane and said W,T point measurement to obtain said optimal packet sending period and said optimal window, and ~~are~~ is constructed using a packet receiver (113) and a packet transmitter (101) of packets or other data units, wherein each packet contains a packet header, ~~and~~;

a node ~~nodes~~ (201) that do or do not use a method to signal said total network capacity W_0,T_0 ~~in form~~ by updating a set of elementary network channel parameters in said packet headers, wherein said network parameters are a cumulative propagation time T_{p0}, a cumulative reciprocal capacity and a minimal channel capacity C_b.

2. (Currently amended) Network of Claim 1 wherein said packet transmitter (101) **comprises** ~~Packet transmitter (101) of Claim 1 that form packet in segmentation process (102) when user data exist and include in it's header acknowledgment data as ordered from the receiver, or form separate acknowledgment packet as ordered from the receiver, store packet in packet buffer (104) and emit packet through packet sending process (105) comprising~~

a header initialization process (103).

3. (Currently amended) Network of Claim 1 wherein said packet transmitter (101) further **comprises** ~~Packet transmitter (101) of Claim 2 further **comprising**~~

a method to send a ~~the~~ packet ~~sending initiation~~ when two conditions are both satisfied: said optimal packet sending period $t'''(\alpha)$ expires and said optimal window $W_0(\alpha)$ is not filled, ~~condition of packet sending period~~

a method to check said optimal packet sending period $t_0'''(\alpha)$ expiration in a process of transmission rate clock signal with a one credit buffer (108), ~~and condition of~~

a method to check said optimal window $W_0(\alpha)$ not being filled in a process of ~~optimal~~ window check (111) that verifies whether current window is less than $W_0(\alpha)$ ~~are both satisfied~~.

4. (Currently amended) Network of Claim 1 wherein said packet transmitter (101) further **comprises**: ~~Packet transmitter (101) of Claim 2 further **comprising**:~~

an area check process (112) to check the position ~~of the~~ said measured point W,T ~~position~~ relative to said hyperbola ~~in area check process (112)~~ by ~~calculating~~ inspecting a condition formula

$$(W-1)/(W_0-1) \geq T_0/((T-T_0)W_0+T_0),$$

a $W_0(\alpha)$ calculation process (110) to calculate ~~calculation of~~ said optimal window $W_0(\alpha)$ ~~in $W_0(\alpha)$ calculation process (110)~~ using $W_0(\alpha) = T_p \cdot W/T + 1$ if said condition formula is satisfied and

$$W_0(\alpha) = T_p/(T-T_p)+1$$ if said condition formula is not satisfied,

a $t_0'''(\alpha)$ calculation process (107) to calculate said optimal packet sending period ~~calculation of~~ $t_0'''(\alpha)$ ~~in $t_0'''(\alpha)$ calculation process (107)~~ using $t_0'(\alpha) = T/W_0(\alpha)$, $t_0''(\alpha) = t_0'(\alpha)(1+\gamma T_0)$ and

$$t_0'''(\alpha)_k = \begin{cases} \beta\, t_0'''(\alpha)_{k-1} + (1-\beta)t_0''(\alpha)_k \\ t_0''(\alpha) \end{cases}$$ wherein β and γ are filtering parameters.

5. (Currently amended) Network of Claim 1 wherein said packet transmitter (101) further **comprises**: ~~Packet transmitter (101) of Claim 2 further **comprising**:~~

a method to use ~~usage of~~ parameters provided by said packet receiver (113) after acknowledgment reception,

a W,T point measurement method ~~in W,T~~ inside ~~the~~ a W,T point measurement process (106) using a transmission time of the packet k $t(P_k)$ and an acknowledgement time of the packet k $t(A_k)$ in formula $T = t(A_k) - t(P_k)$, and a last packet sequence number P_k and a last acknowledgment sequence number A_j in formula $W = P_k - A_j$ and using a window correction formula

$$W_k = (k-j)(t(A_k)-t(P_k))/(t(A_k)-t(A_j))$$ to obtain corrected value for window W;

a method to calculate and correct ~~calculation and correction of parameters~~ said total network capacity point W_0,T_0 and said aggregated propagation time T_p inside a ~~the~~ total capacity estimation and correction process (109).

6. (Currently amended) Network of Claim 1 wherein said packet receiver (113) **comprises** ~~Packet receiver (113) of Claim 2, that after packet reception with packet reception process (115) extract data with extraction process (114) and deliver them to users, comprising~~

an extraction process (114) adapted to extract said ~~of~~ cumulative propagation time from a backward cumulative propagation time variable T_{p0b}, said cumulative reciprocal capacity from a backward cumulative reciprocal capacity variable S_{cib}, said minimal ~~reciprocal~~ channel capacity from a backward minimal channel capacity variable C_{iminb}, said last acknowledgment sequence number ~~and sending time parameters~~ from the said packet header ~~inside the extraction process (114),~~ and said transmission time from a backward transmission time variable $T(p_k)_b$ or from a local record,

a method to deliver ~~delivery of~~ extracted parameters to the packet transmitter (101).

7. (Currently amended) Network of Claim 2 wherein header initialization process (103) **comprises** ~~Initialization process (103) of Claim 2 comprising~~ initialization of packet header variables by:

a method to set a ~~setting the~~ forward last acknowledgment variable a_{jf} to the value of said last acknowledgment sequence number received,

a method to set a ~~setting~~ backward last acknowledgment variable a_{jb} to the value of said ~~the same~~ forward last acknowledgment variable received in packet from the opposite direction, whose acknowledgment number is carried by a new packet,

a method to set a ~~setting~~ forward transmission ~~sending~~ time variable $T(p_k)_f$ to actual local time,

a method to set said ~~setting~~ backward transmission ~~sending~~ time variable $T(p_k)_b$ to the forward value of ~~the same forward~~ said transmission time variable received in packet from the opposite direction, whose acknowledgment number is carried by a new packet.

8. (Currently amended) Network of Claim 2 wherein header initialization process (103) further **comprises** ~~Initialization process (103) of Claim 2 further comprising~~ initialization of said packet header variables when said total network capacity signaling method is used, by using:

a method to set a ~~setting~~ forward cumulative propagation time ~~cumulative~~ variable T_{p0f} to zero;

a method to set a ~~setting~~ forward cumulative reciprocal capacity ~~value cumulative~~ variable S_{cif} to zero;

a method to set a ~~setting~~ forward ~~reciprocal~~ minimal channel capacity variable C_{iminf} to the maximal value;

a method to copy ~~copying~~ values from said forward variables T_{p0f}, S_{Cif}, ~~i~~ and C_{iminf} received in the opposite direction packet to ~~the same~~ said backward variables T_{p0b}, S_{Cib}, and C_{iminb} respectively.

9. (Currently amended) Network of Claim 3 wherein $t_0'''(\alpha)$ calculation process (107) with one credit buffer (108) ~~of Claim 3 comprising~~ **comprises**

a connection startup algorithm for smooth packet sending, ~~and after~~ that acts upon expiration of a time period initialized:

a first method of said startup algorithm used before first acknowledgment reception, and if there is no credit stored, said first method ~~increments~~ sets said credit buffer ~~by~~ to 1 and reinitiates the same value of said time period,

a second method of said startup algorithm used before first acknowledgment reception, and if there is credit stored in said credit buffer, said second method initiates double value of said time period and initiates packet emitting,

a third method of said startup algorithm used after first acknowledgment reception, said third method sets said credit buffer to 1 and initiates packet emitting.

10. (Currently amended) Network of Claim 5 wherein said total ~~Total~~ capacity estimation and correction process (109) ~~of Claim 5 comprising,~~ **comprises**, when said total network capacity signaling method is used

a method to calculate said aggregated propagation time ~~calculation of~~ T_p by

$$T_p = \sum_i T_{pi} + \sum_i T_{si} - T_{sb} = T_{p0} + \overline{M}\left(\sum_i 1/C_i - 1/C_b\right)$$ where $\overline{M}$ stands for average packet length,

a method to calculate said total serving time ~~calculation of~~ T_0 by $T_0 = T_s + T_p$ where T_s stands for service time available from the said minimal channel capacity,

a method to calculate said total network window ~~calculation of~~ W_0 by $W_0 = T_0/T_s$,

a method to apply ~~applying~~ extracted parameters from first or every packet received from the opposite direction.

11. (Currently amended) Network of Claim 5 wherein said total ~~Total~~ capacity estimation and correction process (109) ~~of Claim 5 further comprising,~~ further **comprises**, when said total network capacity signaling method is not ~~network capacity estimation and packet pair methods are~~ used,

a method to calculate said total serving time ~~calculation of~~ T_0 using T_0=T after the first acknowledgment is received,

a method to calculate said total network window ~~calculation of~~ W_0 using $W_0=T_0/(T-T_0)$ after the second acknowledgment is received,

a method to apply ~~applying~~ extracted parameters from every packet received from the opposite direction.

12. (Currently amended) Network of Claim 5 wherein said total ~~Total~~ capacity estimation and correction process (109) ~~of Claim 5 further comprising,~~ further **comprises,** when said total network capacity signaling method is not ~~network capacity estimation and packet pair methods are~~ used, if measured $T<T_0$:

a method to correct said total serving time ~~correction of~~ T_0 using minimal measured value of said delay time T, $T_0=\min(T)$,

a method to correct said total network window ~~correction of~~ W_0 using

$$W_0' = \max\left(\left(T_0'/T_0\right)W_0\ ,\ W\right) \text{ if } T<T_p, \text{ otherwise using } W_0' = T_0'/\left(T_0' - T_p\right) \text{ and } W_0' = T_0'/T_s\ ,$$

where W_0' and T_0' stand for corrected values,

a method to correct said aggregated propagation time ~~correction of~~ T_p using

$$T_p = T_0\left(W_0 - 1\right)/W_0\ ,$$

a method to apply ~~applying~~ measured parameters from every packet received from the opposite direction.

13. (Currently amended) Network of Claim 1 wherein the nodes (201) are adapted to ~~Nodes (201) of Claim 1, that~~ forward packets with forwarding process (202), **comprising**, when said total network capacity signaling method is used,

a capacity signaling process (203).

14. (Currently amended) Network of Claim 13 wherein said capacity signaling process (203) **comprises** ~~Capacity signaling process (203) of Claim 13 comprising the modification of first or every packet by~~

a method to update said ~~updating~~ forward cumulative propagation time ~~cumulative~~ variable T_{p0f} of first or every packet using $T_{p0} = \sum_i T_{pi}$,

a method to update said ~~updating~~ forward cumulative reciprocal capacity ~~value cumulative~~ variable S_{cif} of first or every packet using $T_{s0} = \overline{M}\sum_i 1/C_i$,

a method to update said ~~updating~~ forward ~~reciprocal~~ minimal channel capacity variable C_{iminf} of first or every packet using $C_b = \min_i\left(C_i\right)$.